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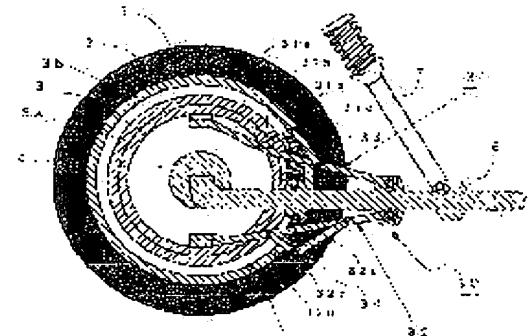
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(22)Date of filing : 30.08.2002 (72)Inventor : NAGAYA TAKESHI

(54) IN-WHEEL MOTOR SYSTEM

(57)Abstract:

PROBLEM TO BE SOLVED: To dissolve instability of a vehicle during travel caused by torque reaction in motor driving, while improving grounding performance and comfortableness during travel on an off-road in the vehicle with wheels suspended to suspension arms extending in the longitudinal direction of the vehicle.

SOLUTION: A rotating side case 3b of an in-wheel motor 3 is connected to a wheel 2 by a flexible coupling, and a nonrotating side case 3a of the motor is connected to the suspension arm 6 by a motor support mechanism 30 provided with first and second motor support members 31, 32 mounted to the suspension arm 6 and provided with support arms 31a, 32a for supporting the nonrotating side case 3a of the motor in a swingable manner, and buffer members 33, 34 with one ends mounted to the suspension arm 6 and the other ends connected to the motor support members 31, 32.



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CLAIMS

[Claim(s)]

[Claim 1]

The suspension of the wheel is carried out by the suspension arm extended to the cross direction of a car. In the in wheel motor system by which the rotation side case and wheel of the direct drive motor of the hollow configuration prepared in the above-mentioned wheel section were combined by the flexible coupling While attaching the nonrotation side case of the above-mentioned motor in the motor anchoring plate by which elastic support is carried out to a spring lower article through an elastic body and an attenuation device pivotable The in wheel motor system characterized by connecting with the above-mentioned suspension arm or a car body rockable through the motor support arm extended to the abbreviation cross direction of a car.

[Claim 2]

The in wheel motor system according to claim 1 characterized by connecting the above-mentioned motor support arm and the nonrotation side case of a motor so that the extended direction of the above-mentioned motor support arm may become abbreviation parallel at a motor rotation direction.

[Claim 3]

The in wheel motor system according to claim 1 characterized by attaching the above-mentioned motor support arm in directly under [of the axle of the nonrotation side case of a motor / abbreviation], or right above [abbreviation].

[Claim 4]

The in wheel motor system characterized by to connect with the above-mentioned suspension arm rockable through the motor support arm which the suspension of the wheel was carried out by the suspension arm which extends to the cross direction of a car , and was equipped with an elastic body and an attenuation device for the nonrotation side case of the above-mentioned motor in the in wheel motor system by which the rotation side case and the wheel of the direct drive motor of the hollow configuration prepared in the above-mentioned wheel section were combined by the flexible coupling , and which extends to the abbreviation cross direction of a car .

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]

This invention relates to the in wheel motor system used in the car which uses a direct-drive wheel as a driving wheel.

[0002]

[Description of the Prior Art]

In recent years, the in wheel motor system which contains a motor in a wheel in the car driven by motors, such as an electric vehicle, is being adopted. The conventional in wheel motor By the way, for example, the patent No. 2676025 official report (drawing 7) and the Patent Publication Heisei No. 506236 [nine to] official report (drawing 8 (a)), Or as indicated by JP,10-305735,A (drawing 8 (b)) It is fixed to the spindle shaft (71J, 84) linked to the components (71, 83, 93) called the upright or knuckle which is one of the components with which the motor section (70, 80, 90) constitutes the axle part of a car. The motor rotor (70R, 80R, 94a) and the wheel (72, 81, 94) have pivotable structure.

Generally, when it runs a concave convex road, fluctuation of the tire touch-down force increases, and it is known that road-holding nature will get worse, so that the mass of the components which correspond under springs, such as a wheel, a knuckle, and a suspension arm, in the car which equipped axle part with suspension devices, such as a spring, and the so-called nonsuspended mass are large.

[0003]

On the other hand, in the car driven by motors, such as an electric vehicle, the in wheel motor which contains a motor in a wheel may be adopted from the height of space efficiency or the transmission efficiency of driving force. However, since the motor stator section be fixed to the spindle shaft linked to the components call the upright or knuckle which be one of the components which constitute the axle part of a car pivotable as mentioned above, the above-mentioned nonsuspended mass increased only the part of an in wheel motor, consequently tire touch-down force fluctuation increased, and the conventional in wheel motor had the trouble that road-holding nature will get worse.

[0004]

In order to solve the above problems, as shown in drawing 9 , then, rotation side case 3b and the wheel 2 which support Rota 3R of the in wheel motor 3 of a hollow configuration While joining together by the flexible coupling 20 which connected two or more plates 21-23 of hollow discoid with the direct-acting guides 24 and 25 and making the torque of the above-mentioned motor 3 transmit to a wheel 2 efficiently By carrying out the suspension of the nonrotation side case 3a which supports stator 3S of the above-mentioned motor 3 to a suspension arm 6 through buffer device 10A equipped with the spring and the damper The in wheel motor system of a configuration of carrying out elastic support to the axle part components of a car, and restraining in the vertical motion direction can be considered.

As above-mentioned buffer device 10A, as shown in drawing 10 , the actuation direction is mutually limited in the vertical direction of a car through the direct-acting guide 11, for example. It is the thing equipped with two plates 14 and 15 combined by the spring 12 and damper 13 which operate in the vertical direction of a car. And specifically Four springs 12 expanded and contracted in the vertical direction of a car are attached in four corners of the plate 15 located in a suspension-arm 6 side. While attaching two dampers 13 expanded and contracted in the vertical direction of a car in the both sides of 15m of pores prepared in the center section The above-mentioned plates 14 and 15 are combined with four direct-acting guides 11 arranged to the core of a plate in the symmetric position, 14m is the pore of a plate 14, 16 is the spring receptacle section, and 17 is the damper anchoring section.

Since floating mounting of the above-mentioned in wheel motor 3 can be carried out to axle part components and the above-mentioned motor itself can be made by this to act as weight of a tuned damper, the touch-down engine performance at the time of irregular way transit and the degree-of-comfort engine performance can be raised.

[0005]

[Problem(s) to be Solved by the Invention]

By the way, when the car of the format in which suspension is carried out as mentioned above by the suspension arm 6 to which a wheel is extended to a car cross direction was equipped with the in wheel motor 3 and a motor 3 drove, the moment which lifts a car centering on an axle according to the torque reaction force occurred in the above-mentioned suspension arm 6, and there was a trouble that the behavior of the car under transit became unstable.

[0006]

This invention was made in view of the conventional trouble, and in the car of the format by which suspension is carried out to the suspension arm to which a wheel is extended to a car cross direction, it aims at offering the in wheel motor system which can cancel the car instability under transit produced according to the torque reaction force at the time of motorised while raising the touch-down engine performance at the time of irregular way transit, and the degree of comfort engine performance.

[0007]

[Means for Solving the Problem]

The in wheel motor system of this invention according to claim 1 The suspension of the wheel is carried out by the suspension arm extended to the cross direction of a car. In the in wheel motor system by which the rotation side case and wheel of the direct drive motor of the hollow configuration prepared in the above-mentioned wheel section were combined by the flexible coupling While attaching the nonrotation side case of the above-mentioned motor in the motor anchoring plate by which elastic support is carried out to a spring lower article through an elastic body and an attenuation device pivotable By connecting with the above-mentioned suspension arm or a car body rockable through the motor support arm extended to the abbreviation cross direction of a car While carrying out floating mounting of the above-mentioned motor to axle part components, making the above-mentioned motor act as weight of a tuned damper and raising tire road-hugging and degree-of-comfort nature It responds to the torque reaction force produced in a motor nonrotation side at the time of motorised by the above-mentioned torque rod, and the car instability under transit by the above-mentioned torque reaction force is canceled.

[0008]

As the extended direction of the above-mentioned motor support arm becomes abbreviation parallel at a motor rotation direction, an in wheel motor system according to claim 2 is what connected the above-mentioned motor support arm and the nonrotation side case of a motor, and since it can respond to the above-mentioned torque reaction force as force of the car cross direction of a motor support arm certainly, thereby, it becomes possible [reducing the instability of a car effectively].

An in wheel motor system according to claim 3 attaches the above-mentioned motor support arm in directly under [of the axle of the nonrotation side case of a motor / abbreviation], or right above [abbreviation].

[0009]

Moreover, an in wheel motor system according to claim 4 The suspension of the wheel is carried out by the suspension arm extended to the cross direction of a car. It is the in wheel motor system by which the rotation side case and wheel of the direct drive motor of the hollow configuration prepared in the above-mentioned wheel section were combined by the flexible coupling. By connecting the nonrotation side case of the above-mentioned motor with the above-mentioned suspension arm rockable through the motor support arm equipped with the elastic body and the attenuation device extended to the abbreviation cross direction of a car While carrying out floating mounting of the above-mentioned motor to axle part components, it responds to the torque reaction force produced in a motor nonrotation side at the time of motorised by the above-mentioned motor support arm. While becoming possible to raise tire road-hugging and degree-of-comfort nature by this, it becomes possible to cancel the car instability under transit by the above-mentioned torque reaction force.

[0010]

[Embodiment of the Invention]

Hereafter, the gestalt of operation of this invention is explained based on a drawing.

In addition, the part which is common for the conventional example is explained during the following explanation using the same sign.

[0011]

The gestalt 1 of operation

Drawing 1 and drawing 2 are drawings showing the in wheel motor structure of a system concerning the gestalt 1 of this operation. The wheel to which a tire and 2 change from rim 2a and wheel-disc 2b in each drawing in 1, and motor stator (henceforth stator) 3S which were fixed to nonrotation side case 3a by which 3 was prepared inside to radial, It is the in wheel motor of the outer rotor mold equipped with motor rotor (henceforth Rota) 3R fixed to rotation side case 3b which was prepared outside to radial and joined pivotable to the above-mentioned nonrotation side case 3a through bearing 3j.

The hub section with which 4 was connected in a wheel 2 and its revolving shaft, and 5 were connected with the suspension arm 6 extended to a car cross direction. The knuckle which are the axle part components of a car, the suspension member to which 7 changes from a shock absorber etc., The damping device which consists of the brake disc with which the above-mentioned hub section 4 was equipped with 8, the motor suspension device in which 10 carries out the suspension of the nonrotation side case 3a of a motor to the above-mentioned suspension arm 6, and 20 are flexible couplings which combine rotation side case 3b of a motor, and a wheel 2.

[0012]

As the above-mentioned motor suspension device 10 is shown in drawing 3 (a), nonrotation side case 3a of a motor, and a knuckle 5 The actuation direction is mutually limited in the vertical direction of a car through the direct-acting guide 11. And while joining together with two plates, the motor anchoring plate 14 and the knuckle anchoring plate 15, combined by the spring 12 and damper 13 which operate in the vertical direction of a car As shown in drawing 3 (b), the connection means 18 which consists nonrotation side case 3a of a motor of slide metal or bearing is minded. As it attaches in the motor anchoring plate 14 located in a motor 3 side pivotable and is further shown in drawing 1 and drawing 2 It is what connected nonrotation side case 3a of the above-mentioned motor with the above-mentioned suspension arm 6 rockable through the torque rod 19 which is the motor support arm extended to the abbreviation cross direction of a car. While this supports nonrotation side case 3a of a motor elastically to the knuckle 5 which are the axle part components of a car, it responds to the torque reaction force produced in a motor nonrotation side at the time of motorised. While attaching the end of the above-mentioned torque rod 19 in the above-mentioned suspension arm 6 by this example at this time, he is trying to attach the other end in the part of the axle of nonrotation side case 3a of a motor which is mostly equivalent to directly under.

In addition, in drawing 3 (a), 14m is the pore of a plate 14, 15m is the pore of a plate 15, and the knuckle 5 connected with the above-mentioned suspension arm 6 at 15m of this pore is attached. Moreover, 16 is the spring receptacle section prepared in the moving-part side of the above-mentioned spring 12 on the motor anchoring plate 14, and 17 is the damper anchoring section for attaching a damper 13.

[0013]

Namely, it sets in the motor suspension device 10 of this example. Above-mentioned drawing 9 and the motor anchoring plate 14 of buffer device 10A shown in 10 mind the above-mentioned connection means 18. Since it connects with the suspension arm 6 rockable through the torque rod 19 which it is attached in nonrotation side case 3a of a motor pivotable, and nonrotation side case 3a of this motor extends to the abbreviation cross direction of a car When torque reaction force arises in the nonrotation side of a motor 3 at the time of a drive, it can respond to this turning effort as force of the cross direction of the above-mentioned torque rod 19 which is a motor support arm.

Therefore, since it does not generate, the moment which raises a car body to a suspension arm 6 becomes possible [canceling the car instability under transit by the above-mentioned torque reaction force].

Moreover, in this example, as mentioned above, since the above-mentioned torque rod 19 is attached in the part of the axle of nonrotation side case 3a of a motor which is mostly equivalent to directly under, it can respond to the above-mentioned torque reaction force as force of the car cross direction of a torque rod 19 certainly. Therefore, the relief effectiveness by the above-mentioned torque reaction force can be prevented certainly, and the instability of a car can be reduced effectively.

Moreover, since nonrotation side case 3a of a motor is elastically supported by the above-mentioned motor suspension device 10 to the knuckle 5 which are the axle part components of a car and the motor 3 above itself acts as a tuned damper, the touch-down engine performance at the time of irregular way transit and the degree-of-comfort engine performance can be raised.

[0014]

Drawing 4 is drawing showing the example of 1 configuration of a flexible coupling, and this flexible coupling 20 is equipped with the direct-acting guides 24 and 25 arranged so that the front flesh side of two

or more plates 21-23 of hollow discoid and the central plate 22 of hollow discoid and the actuation direction may cross at right angles mutually. The guide members 24a and 24a attached in the field of the opposite side at intervals of 180 degrees in the wheel 2 of the plate 21 located in a detail at a wheel 2 side, It is attached in the above-mentioned plate 21 side of the middle plate 22, and the plates 21 and 22 of hollow discoid are combined with the direct-acting guide 24 which consists of the guide rails 24b and 24b which engage with the above-mentioned guide members 24a and 24a. The guide rails 25b and 25b attached in the direction which rotated the above-mentioned guide rails 24b and 24b 90 degrees at intervals of 180 degrees by the rear-face side of the above-mentioned plate 22, It is what combines the plates 22 and 23 of hollow discoid with the direct-acting guide 25 which consists of the guide members 25a and 25a which are attached in the above-mentioned plate 22 side of the plate 23 by the side of a motor 3, and engage with the above-mentioned guide rails 25b and 25b. Since a motor shaft and a wheel shaft are combined in every direction possible [eccentricity] by this, it becomes possible to make the torque from rotation side case 3b to a wheel 2 transmit efficiently.

[0015]

With the gestalt 1 of this operation, thus, nonrotation side case 3a of the in wheel motor 3, and a knuckle 5 While joining together with two plates 14 and 15 combined by the spring 12 and damper 13 which the actuation direction is mutually limited in the vertical direction of a car through the direct-acting guide 11, and operate in the vertical direction of a car The above-mentioned nonrotation side case 3a is attached in the motor anchoring plate 14 located in a motor 3 side pivotable. Furthermore, since the above-mentioned nonrotation side case 3a was connected with the above-mentioned suspension arm 6 rockable through the torque rod 19 extended to the abbreviation cross direction of a car While being able to make a motor 3 able to act as weight of a tuned damper and being able to raise tire road-hugging and degree-of-comfort nature Even when torque reaction force arises in a motor nonrotation side at the time of motorised, since it can respond to the above-mentioned torque reaction force as force of a car cross direction, it cancels and the thing of the car instability under transit by torque reaction force can be carried out.

Moreover, the torque from rotation side case 3b to a wheel 2 can be made to transmit efficiently by combining rotation side case 3b of the in wheel motor 3, and a wheel 2 by the flexible coupling 20 which connected two or more plates 21-23 of hollow discoid with the direct-acting guides 24 and 25 arranged so that the actuation direction may intersect perpendicularly mutually.

[0016]

In addition, although the gestalt 1 of the above-mentioned implementation explained the case where attached in the suspension arm 6 the end of the torque rod 19 which is the above-mentioned motor support arm, and the other end was attached in nonrotation side case 3a of a motor, the same effectiveness can be acquired even if it attaches the end of a torque rod 19 in a car-body side.

Moreover, what is necessary is for the partial attachment beam which corresponds directly under [abbreviation] the axle of nonrotation side case 3a of a motor not to restrict a torque rod 19 to this, and just to have connected in the above-mentioned example, so that the extended direction of the above-mentioned torque rod 19 may be parallel (0 degree **10 degrees) mostly at a motor rotation direction about the above-mentioned torque rod 19 and nonrotation side case 3a of a motor. At this time, it can respond to the above-mentioned torque reaction force certainly as force of the car cross direction of a torque rod 19 by attaching the above-mentioned torque rod 19 in the part of the axle of nonrotation side case 3a of a motor which is mostly equivalent to directly under, or the part of the above-mentioned axle which corresponds right above mostly.

[0017]

The gestalt 2 of operation

Drawing 5 and drawing 6 are drawings showing the in wheel motor structure of a system concerning the gestalt 2 of this operation. Stator 3S by which it was fixed to nonrotation side case 3a by which 3 was prepared [as opposed to / in a tire and 2 / radial] inside for 1 in each drawing as opposed to the wheel, The in wheel motor of the outer rotor mold equipped with Rota 3R fixed to rotation side case 3b which was prepared outside to radial and joined pivotable to the above-mentioned nonrotation side case 3a through bearing 3j, The knuckle connected with the suspension arm 6 to which 4 is extended in the hub section and 5 is extended to a car cross direction, and 7 are a suspension member and a damping device with which 8 consists of a brake disc.

Moreover, the flexible coupling which showed 20 to the gestalt 1 of the above-mentioned implementation and which combines rotation side case 3b of a motor and a wheel 2, and 30 are the motor support devices for carrying out the suspension of the nonrotation side case 3a of a motor to a suspension arm 6.

[0018]

The 1st and 2nd motor supporter material 31 and 32 which the above-mentioned motor support device 30 is attached in the suspension arm 6 which an end extends to the cross direction of the above-mentioned car, and support nonrotation side case 3a of a motor in the vertical direction, respectively, The end was attached in the above-mentioned suspension arm 6, respectively, and it has the buffer members 33 and 34 equipped with the spring and the attenuation device which the other end was connected with the above 1st and the 2nd motor supporter material 31 and 32, respectively.

The 1st motor supporter material 31 is the thing equipped with support arm 31a to which an end side is attached in the suspension-arm 6 bottom rockable, and supports nonrotation side case 3a of a motor by the other end side. While supporting nonrotation side case 3a of a motor elastically by combining this support arm 31a and the above-mentioned buffer member 33, nonrotation side case 3a of the above-mentioned motor is connected rockable to a suspension arm 6. In addition, in order to take the large stroke of the spring member which constitutes the above-mentioned buffer member 33, he attaches two pieces 31b and 31c of connection combined mutually, and is trying to combine the motor supporter material 31 and the above-mentioned buffer member 33 of the above 1st with the upper part side of support arm 31a in the above-mentioned end-point 31z on the above-mentioned support arm 31a in this example by projection and end-point 31z.

Moreover, the 2nd motor supporter material 32 is the same configuration as the motor supporter material 31 of the above 1st. Support arm 32a to which an end side is attached in the suspension-arm 6 bottom rockable, and supports the opposite side by the other end side with the above-mentioned support arm 31a of nonrotation side case 3a, It is prepared on this support arm 32a, consists of two pieces 32b and 32c of connection mutually combined by end-point 32z, and is combined with the above-mentioned buffer member 34 which consists of a spring and a damper in the above-mentioned end-point 32z.

[0019]

In the motor support device 30 of the above-mentioned configuration, since the support arms 31a and 32a of the above 1st equipped with the above-mentioned buffer members 33 and 34 and the 2nd motor supporter material 31 and 32 respond to the above-mentioned torque reaction force as force of a car cross direction even when torque reaction force arises in the nonrotation side of a motor 3 at the time of the drive of a motor 3, the moment which raises a car body is not generated in the above-mentioned suspension arm 6. Therefore, since nonrotation side case 3a of a motor can be connected rockable to a suspension arm 6 while being able to support a motor 3 firmly by using the above-mentioned motor support device 30, it becomes possible to cancel the car instability under transit by the above-mentioned torque reaction force.

Moreover, according to the above-mentioned motor support device 30, since nonrotation side case 3a of a motor can be elastically supported to the knuckle 5 which are the axle part components of a car, a motor 3 acts as a tuned damper. Therefore, the touch-down engine performance at the time of irregular way transit and the degree-of-comfort engine performance can be raised.

Furthermore, since the structure of the circumference of a knuckle 5 is sharply simplified as compared with the suspension approach of the motor shown in the above-mentioned conventional example or the gestalt 1 of the above-mentioned implementation, the configuration of this example has the advantage that it can have good effect also on cooling of a brake.

[0020]

Thus, with the gestalt 2 of this operation, while combining rotation side case 3b of the in wheel motor 3, and a wheel 2 by the flexible coupling 20 The 1st and 2nd motor supporter material 31 and 32 equipped with the support arms 31a and 32a which nonrotation side case 3a of the above-mentioned motor is attached by the suspension arm 6, and support nonrotation side case 3a of a motor rockable, Since it was made to connect with a suspension arm 6 according to the motor support device 30 equipped with the buffer members 33 and 34 by which the end was attached in the suspension arm 6 and the other end was connected with the above-mentioned motor supporter material 31 and 32 Since it can respond to the above-mentioned torque reaction force as force of a car cross direction even when torque reaction force arises in the nonrotation side of a motor 3 at the time of a drive while being able to support a motor 3 firmly, it cancels and the thing of the car instability under transit by the above-mentioned torque reaction force can be carried out.

Moreover, since the above-mentioned motor support device 30 supports nonrotation side case 3a of a motor elastically to the knuckle 5 which are the axle part components of a car, motor 3 self acts as a tuned damper. Therefore, also in this example, the touch-down engine performance at the time of irregular way transit and the degree-of-comfort engine performance can be raised.

[0021]

[Effect of the Invention]

As explained above, while combining the rotation side case and wheel of a motor by the flexible coupling and attaching the nonrotation side case of a motor in a motor anchoring plate pivotable, according to this invention Since it was made to connect with the above-mentioned suspension arm rockable through the motor support arm extended to the abbreviation cross direction of a car Since it can respond to the torque reaction force produced in a motor nonrotation side at the time of motorised while being able to raise the touch-down engine performance at the time of irregular way transit, and the degree-of-comfort engine performance, the car instability under transit is cancelable.

Moreover, the car instability under transit by the above-mentioned torque reaction force is cancelable by connecting the nonrotation side case of the above-mentioned motor with the above-mentioned suspension arm rockable through the motor support arm which extends to the abbreviation cross direction of a car equipped with the elastic body and the attenuation device, and considering as the configuration which responds to the torque reaction force produced in a motor nonrotation side at the time of motorised by the above-mentioned motor support arm.

Moreover, it becomes possible by adopting the in wheel motor system of this invention to excel in space efficiency or the transmission efficiency of driving force, and to realize an in wheel motor vehicle with little tire touch-down force fluctuation.

[Brief Description of the Drawings]

[Drawing 1] It is drawing of longitudinal section showing the in wheel motor structure of a system concerning the gestalt 1 of operation of this invention.

[Drawing 2] It is drawing showing the in wheel motor structure of a system concerning the gestalt 1 of operation of this invention.

[Drawing 3] It is drawing showing the joint approach of the motor suspension device concerning the gestalt 1 of this operation, and the nonrotation side case of a motor.

[Drawing 4] It is drawing showing the example of 1 configuration of a flexible coupling.

[Drawing 5] It is drawing of longitudinal section showing the in wheel motor structure of a system concerning the gestalt 2 of operation of this invention.

[Drawing 6] It is drawing showing the motor support device concerning the gestalt 2 of this operation.

[Drawing 7] It is drawing showing the configuration of the conventional in wheel motor.

[Drawing 8] It is drawing showing the configuration of the conventional in wheel motor.

[Drawing 9] A motor is drawing showing the example of 1 configuration of the in wheel motor system of a configuration of having a tuned-damper function.

[Drawing 10] It is drawing showing the configuration of the buffer device in which it is used for the in wheel motor of drawing 9.

[Description of Notations]

1 Tire and 2 Wheel and 2a Rim and 2b Wheel Disc and 3 In Wheel Motor and 3R Motor Rotor and 3S Motor Stator and 3a Nonrotation Side Case and 3J Bearing and 3B Rotation Side Case and 4 Hub Section and 5 Knuckle,

6 Suspension Arm and 7 Suspension Member and 8 Damping Device and 10 Motor Suspension Device and 11 Direct-acting Guide and 12 Spring and 13 Damper and 14 Motor Anchoring Plate and 14M Pore of Motor Anchoring Plate, and 15 Knuckle Anchoring Plate and 15M Pore of Knuckle Anchoring Plate, and 16 Spring Receptacle Section,

17 Absorber Anchoring Section and 18 Connection Means and 19 Torque Rod and 20 Flexible Coupling, and 21-23 24 Plate of Hollow Discoid, and 25 Direct-acting Guide and 30 31 Motor Support Device and 32 Motor Supporter Material,

31a and 32a A support arm, and 31b, 31c, 32b and 32c Piece of connection,
31z and 32z 33 An end point and 34 Buffer member.

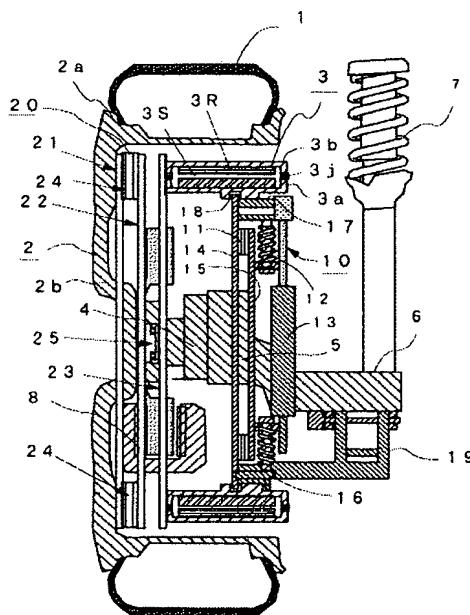
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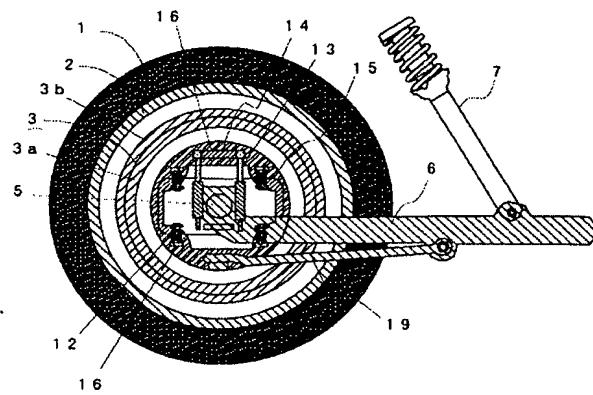
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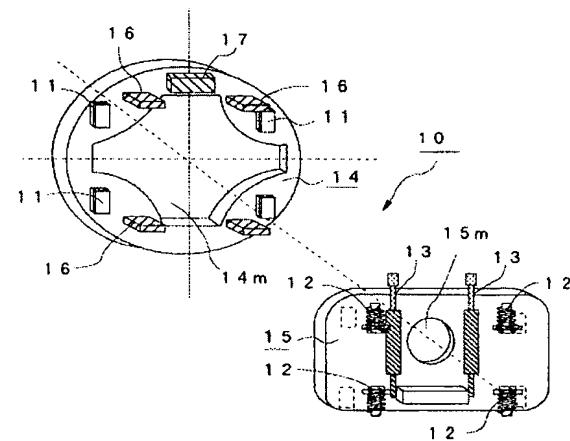
DRAWINGS

[Drawing 1]**[Drawing 2]**

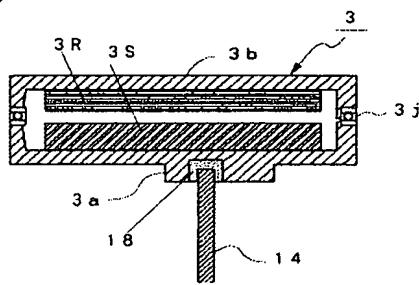


[Drawing 3]

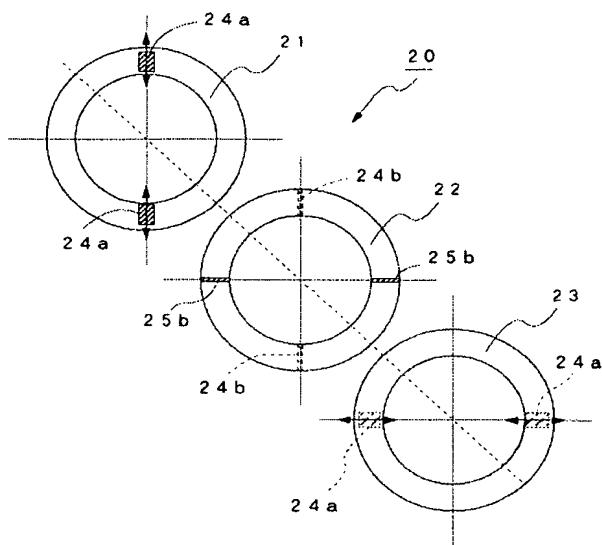
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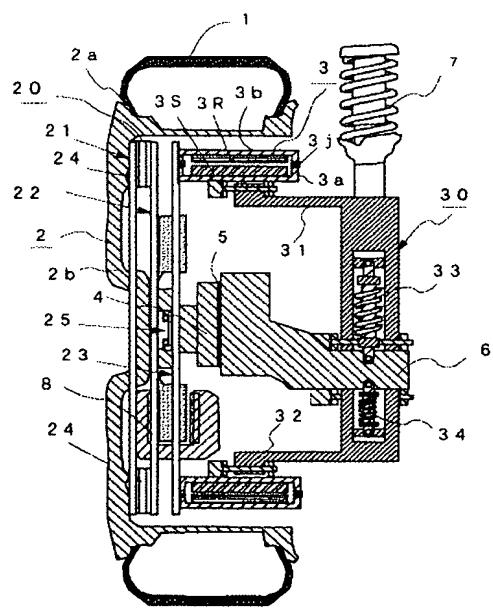
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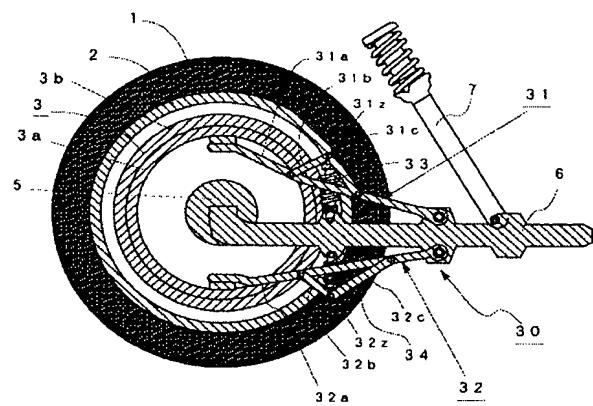
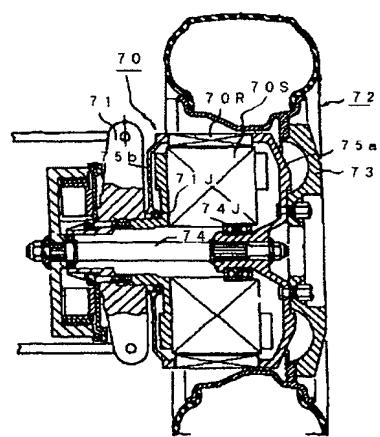


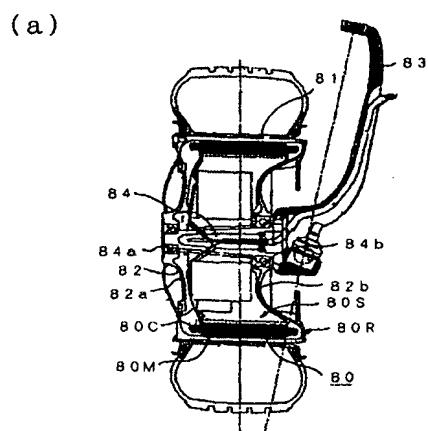
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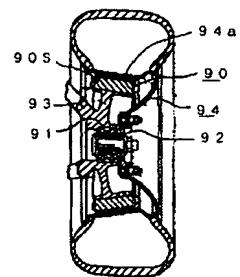
[Drawing 5]



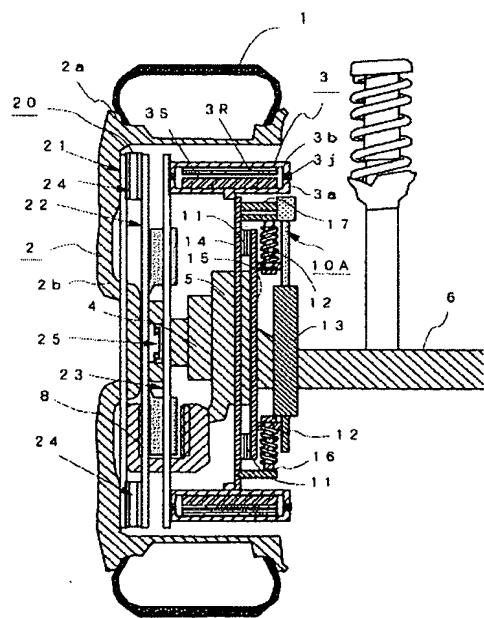
[Drawing 6][Drawing 7][Drawing 8]



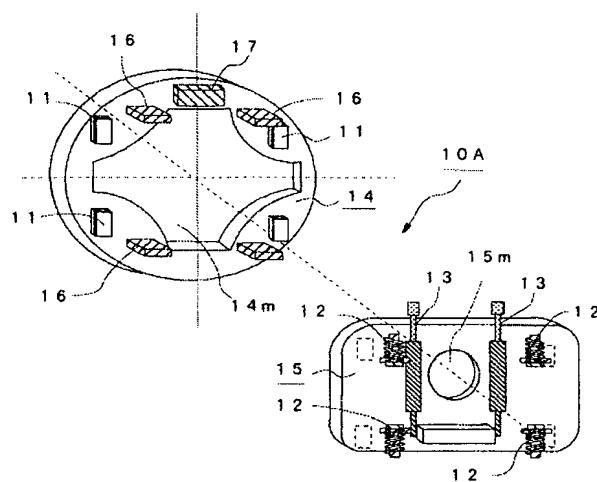
(b)



[Drawing 9]



[Drawing 10]



[Translation done.]